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New Jersey Agricultural Experiment Station

Circular 106

Seed and Soil Treatment for Vegetable Diseases*

Poor seed may be due to any one of several causes such as:

(1) Imperfect or improper pollination resulting in poor germination or mixing of varieties;
(2) Immaturity;
(3) Injuries due to fermentation before drying;
(4) Injuries due to moisture in storage or during shipment;
(5) Injuries due to wrong temperature in storage or in transit;
(6) Injuries due to fungi, bacteria, and nematodes; all of which will cause poor germination.

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ANTHRACNOSE OF BEANS

Fungi and Bacteria. This circular deals only with the plant diseases which are carried on or in the seeds and which can be reduced by seed selection and seed treatment.

Seed selection should be practiced where possible. It is much better to start with clean seed and grow healthy plants than to grow diseased plants which must be treated. By seed selection we mean (1) the selection of seed from healthy plants which is a most important practice wherever possible and (2) the sorting and selection of clean seeds after harvest which can be done in the case of beans and to some extent with other large seeds. By seed treatment we mean

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the treatment of seeds with hot water or chemicals to destroy the organisms which cause disease without material injury to the seeds.

CAUTION. *Seed treatment should be conducted very carefully as there is always some danger of injuring the seeds. It must also be remembered that the treatments will differ with different kinds of seed. A successful treatment with one kind of seed will frequently prove injurious if used with another kind of seed.*

CAUTION. *Seed treatment is worthless unless the seeds are planted in clean soil.* (see page 3).

CAUTION. *Corrosive sublimate is a deadly POISON and must be kept out of reach of children and irresponsible persons. Do not mix it in a metal container; it attacks the metal.*

CAUTION. *Formaldehyde is very irritating to the skin, especially to the nose and eyes. It is not poisonous.*

BEANS

Anthracnose. This disease appears as large, pinkish, reddish, orange colored, brownish or black cankers on the pods of some varieties of wax string and bush beans. It also occurs on the stems, leaves and roots and causes a characteristic spotting of the seeds. Growers should select perfectly healthy pods from vigorous productive plants for seed. In case seed is bought it should be examined carefully and all seeds that show suspicious spots or wrinkles and cracks should be thrown out. These precautions will also tend to reduce *bacterial blight, rust* and *mosaic.* Disinfection by soaking the seeds is not very satisfactory. (See circular 84).

BEETS

Black rot. Soak the seeds for 20 minutes in formaldehyde (1 oz in 6 quarts of water) wash in clean water, dry or plant immediately.

CABBAGE

Black rot, black leg and yellows. Soak the seed for 15 or 20 minutes in formaldehyde (1 oz. in 2 gallons of water, which is about 1 teaspoonful in a teacup of water), wash in clean water and dry. Or soak for 10 or 15 minutes in corrosive sublimate (1 part in 1000 parts water), wash and dry.

CAULIFLOWER

Same as for cabbage.

CELERY

Leaf blight. Soak the seed for 30 minutes in warm water (about 100° F.) then for three hours in formaldehyde (one oz., which is about one teaspoonful, in 3 quarts of water) wash and dry. Or, soak for 30 minutes in warm water (about 100° F.) then for 30 minutes in corrosive sublimate (1 part in 1000 parts water), wash and dry.

CUCUMBERS

Angular leaf spot and anthracnose. Soak for 5 minutes in corrosive sublimate (1 part in 1000 parts water), wash for 15 minutes and dry.

EGGPLANT

Leaf spot and fruit rot. Select seed from healthy fruits. Soak in corrosive sublimate (1 part in 1000 parts of water) for ten minutes. Wash in running water for fifteen minutes and plant immediately.

LIMA BEANS

Pod and leaf spot. Select healthy pods from healthy plants. Throw out all seeds that show discolorations or that are wrinkled.

ONIONS

Smut. Mix 1 pint of formaldehyde in 30 gallons of water. Put the seed in the row and sprinkle each 100 feet with 3 or 4 quarts of the above mixture and cover immediately.

POTATO

See Circular 105.

SWEET CORN

See Circular 102.

SWEET POTATO

See Circular 89.

SEED-BEDS AND SOIL STERILIZATION

Nothing is gained by seed treatment if the seeds are planted in diseased soil.

NOTE—For diseases of barley, corn, oats, rye, and wheat, see Circular 102.

Damping off organisms are responsbile for exceptionally heavy losses, especially in seed-beds and cold frames. The seed-bed losses are not restricted to the actual killing of seedling plants, but thousands of slightly infected plants, which are apparently healthy, are taken from the seed-beds and set in the fields. The disease develops later and the plants die or give reduced yields. Many thousands of dollars could be saved by the use of clean seed-beds and cold frames.

Seed-beds and cold frames should be prepared with the greatest care in order to prevent the infection of young plants before setting. In most cases, manures are used in seed-beds and cold frames, but the fact that organisms which cause certain diseases are carried in this way and that damping-off organisms thrive in them makes it desirable to use nothing but commercial fertilizers in some cases. (Of course, when the commercial fertilizers are used exclusively, it is necessary to use artificial heat.) It is advisable to put the seed-beds or cold frames in a new place each year if possible, but if this is not done the old soil should be removed and the wood work carefully sterilized, or both soil and wood work sterilized. If the soil

is removed, care should be taken that it is all removed and carried to a considerable distance. Small amounts of soil left in the beds are frequently sufficient to perpetuate the disease. If the soil is not carried away from the bed, small particles are likely to be returned to the bed on the implements or on the workers' feet or hands. The wood work of the seed-beds should be thoroughly drenched with hot water or a solution of formaldehyde (1 pound to 20 gallons of water). If the old soil is used or if there is any reason to suspect new soil of being infected, it should be sterilized with steam or formaldehyde.

Soil sterilization is usually used in seed-beds, cold frames and green-houses, but is sometimes used on soil in the open. The most common methods are the use of formaldehyde and of steam. The soil to be treated should be loose and moist.

The formaldehyde solution (4 pounds of formaldehyde to 50 gallons of water) is applied at the rate of 1 gallon to each square foot of soil surface. In case the soil is very loose it may be necessary to make the application slowly over several hours, otherwise the liquid will run through very quickly and be lost. The soil should not be stirred during treatment. Immediately after treatment the soil should be covered with burlap, old carpet, fertilizer bags or paper for two days. It should then be aired for ten days or two weeks and during this period should be stirred thoroughly three or four times.

CAUTION. If the soil is not thoroughly aired after treatment, the seeds may be injured and not germinate well. The seeds of some kinds of plants are much more susceptible to injury than are those of others. If the soil is thoroughly aired there is no danger. Do not add manure or other soil to the sterilized soil; it may carry organisms of disease. Be sure that the work tools are clean; they may carry disease organisms. The workman should not step into the bed after the soil is sterilized; the soil on his shoes may carry organisms which cause disease.

The most general method for steam sterilization is known as the inverted-pan method. The pans can be made of No. 22 galvanized sheet iron or pine lumber. For out-door work they should be made about 6x10 feet. They are attached to a boiler of 15 horsepower or more by means of a 1-inch hose which connects with a nipple in the center of the pan. The edges of the pan should be pushed down into the loose soil and weighted. The steam should then be turned on and the temperature held at 200° or 250° F. for about one hour.

CAUTION. It should be remembered that this treatment cannot be used satisfactorily on shale soils or any other soil that tends to pack. Sometimes the first crop on soil subjected to high steam sterilization does not thrive, but the second crop is usually satisfactory.